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## Identifying Health and Wellbeing Living Lab Business Model Attributes

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**Abstract:** The number of officially certified Living Labs have been steadily growing since the launch of European Network Living Labs (ENoLL) over a decade ago. By far the most popular thematic focus area among ENoLL members is the health and wellbeing, which covers nearly a half of all certified Living Labs. However, the studies evaluating Living Lab business models in general and especially those focusing on health and wellbeing Living Labs are rare. By applying industry standard Business Model Canvas (BMC) approach, this study identifies what kind of attributes Health and Wellbeing Living Labs are including within nine business model canvas elements. The data grounded on 16 Baltic Sea region Health and Wellbeing Living Labs identified a great attribute variety, which are ranked based on popularity. Our findings clearly support previous suggestions which argue that Living Labs have common elements, but multiple different implementations. The need to develop Living Lab specific business modelling tools was recognized.

**Keywords:** Living lab; Health, Wellbeing, Business model, Business Model Canvas, Lean Canvas, Service Business Model Canvas, Service Logic Business Model Canvas, Baltic Sea

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### 1. Introduction

The world's population is aging rapidly especially in Japan and some European countries (OECD, 2016). Importantly the aging process is proceeding globally and is expected to continue also in the forthcoming decades. Aging population has significant socio-economic consequences and therefore novel technological, service and business model innovations are in high demand in health and wellbeing domain. Co-creation, user centric and user-driven innovation methods are suggested as a one way to find solutions to diverse health and wellbeing problems (Ramaswamy and Ozcan, 2018). These innovation methods were originally focused on the co-creation of value by a firm's customers, but are

lately more and more described as a collaboration between various Quadruple Helix actors (Arnkil et al. 2010). Living Labs (later LLs) are among the user-centred open innovation methodologies in which various co-creation methods can be applied.

However, studies focusing on LL business models are relatively rare and therefore the aim of this study is to identify and define what kind of business models health and wellbeing LLs are currently following. Furthermore, by utilizing multiple business model canvas approaches during the data collection process, the perceived usefulness of the investigated canvases will be compared.

## **2. Living Lab Business Modelling**

### *2.1 About Health and Wellbeing Living Labs*

According to the European Network of Living Labs (ENoLL), the international federation of benchmarked LLs in Europe and worldwide, Living Labs are:

*“User-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings. They operate as intermediaries among citizens, research organisations, companies, cities and regions for joint value co-creation, rapid prototyping or validation to scale up innovation and businesses. Living Labs have common elements but multiple different implementations.”*

The number of officially certified LLs have been steadily growing since the launch of European Network Living Labs (ENoLL) over decade ago (Garcia Robles et. al. 2016). Historically there have been nearly 400 officially recognised LLs across the world. Currently there are 170 active LL members in ENoLL. Importantly, the most popular LL thematic focus area among ENoLL members is health and wellbeing. This thematic area, covers 44% of all ENoLL LLs (N=74). However, a great majority (78%, N=58) of the Health and Wellbeing LL (later HWLL) are also operating in various other domains such as “Smart cities & Regions”, “Culture & creativity, Energy, Mobility, “Social inclusion”, “Social innovation”, “E-government” or Education.

According to ENoLL’s definition, LLs are operating in the real-life environments together with end-users and various other relevant stakeholders while utilizing various research and development methods. As a result, there are multiple implementations and a great variety of locations where LLs are operating. Therefore, it is suggested that there are also multiple business models, which can significantly differ between the LLs.

### *2.2 Tools to Evaluate and Develop Business Models*

Business model (Osterwalder, 2004) and especially business model innovation (Chesbrough, 2010) as a research domain are both relatively young phenomena. The prior literature reviews have argued that there is no overall definition for business model (Zott et al., 2011). Generally speaking a business model is a method in which an organization builds and uses its resources to offer their customers better value than their competitors, and make profit by doing so (Afuah and Tucci, 2001). Business model combines potential

environmental factors and organization's capabilities in order to define and implement a sustainable recipe for competitive advantage.

Multiple theoretical models to evaluate and develop business models have been suggested especially in a form of "canvas". Canvas approach became extremely popular after the introduction of Business Model Canvas (BMC) by Osterwalder and Pigneur (2010). The canvas approach is also an essential element in the service design and co-creation toolbox and a great variety of canvases for different purposes have been suggested. Theoretically BMC is grounded on a system-level holistic view on the business logic of an economic entity (Zolnowski and Böhmman, 2014; Zott et al., 2011). Other rivalling business model canvas approaches include e.g. (1) Lean canvas (Maurya, 2012), (2) multiple embodiments of "Service business model canvas" (Zolnowski and Böhmman, 2014; Daxboeck, 2013) and (3) also "Service logic business model canvas" (Ojasalo and Ojasalo, 2015) which has similar theoretical foundation as the Service business model canvas.

As a result all the canvases includes partially common and non-common elements (see Appendix 1) while the viewpoints and backgrounds questions for each item varies from focal company, partner to customers perceptive and in some cases even to customer's partnerships.

### *2.3 Living Lab Business Models*

In general most of the LL studies focusing on business modelling have more or less been grounded on single or combination of only few case studies. This is typical approach when a particular research stream is still evolving strongly. Schaffers et al. (2007) identified preconditions and critical aspects for rural LL business model and concluded that LL business model includes "various dimensions of partnership creation and operation across the different Living Labs development stages". This finding highlight the importance of understanding the maturity of LL when defining a business model. Rits et al. (2015) explored the benefits of integrating business model research within LL project and argued that these two methodologies are complementary and should be utilized in conjunction. Mastelic et al. (2015) investigated ENoLL's new member evaluation process and what kind of selection criteria measures are included during this process. As a result, they suggested that the following business model elements are missing from current ENoLL evaluation criteria process: 1) identification of the cost structure, 2) customer segments and 3) the revenue stream. To conclude, the various business model canvases can be promising tools to empirically evaluate the existing business models among the Health and Wellbeing LLs, which are currently more or less uncharted.

## **3 Research methodology**

### *3.1 Data Collection and Response*

The unit of analysis in this study is a LL which is thematically focusing on the health and wellbeing topics. The data for this study is grounded on the self-evaluation of the 16 LL which taking a part to the ProVaHealth project. ProVaHealth project is funded by the Interreg Baltic Sea Region which is a part of the European Regional Development fund. Country wise the dataset is covering LLs from Estonia, Denmark, Finland, Germany,

Latvia, Lithuania, Poland and Sweden. The key informants from most of the LLs were contacted in face-to-face workshop during the project consortium meeting. Later on the written guidelines to fulfil the four business model canvases were send by email. Data collection took place during March – April 2018.

The included canvases were the original Business Model Canvas by Osterwalder and Pigneur (2010), Lean canvas (Maurya, 2012), Service business model canvas (Zolnowski and Böhmman, 2014) and Service logic business model canvas (Ojasalo and Ojasalo, 2015). These canvases were including both common and non-common items as defined in the Appendix 1 and 2. Using multiple canvases enabled theory triangulation (Smith, 1975:273; Denzin 1978, p. 291) which can provide more insight into topic and as well as a better reliability and validity for the results. However, due space limitations this study is reporting only the data generated by the original Business Model Canvas elements, thus omitting the non-matching elements. In the Table 1, number of responses for each canvas are summarized.

**Table 1:** Comparison of responses between four Business Model Canvas (N = 16)

<i>Business Model Canvas type</i>	<i>Number of responses</i>
Business Model Canvas (Osterwalder and Pigneur 2010)	12 (75%)
Lean canvas (Maurya, 2012)	16 (100%)
Service business model canvas (Zolnowski and Böhmman, 2014)	13 (81%)
Service logic business model canvas (Ojasalo and Ojasalo, 2015)	13 (81%)

### 3.2 Reliability Analysis of the Canvas Data

After receiving the filled canvases, the key informants from each LL were contacted by email to evaluate the reliability of the responses. In all only 10 responses were received for the following questions: (1) Who filled these canvases, (2) How much time did it take to fill out the canvases, (3) If it was difficult to fill these, what would be the reason for that, in your opinion, and (4) Any suggestions of how to develop these canvases to help you out in developing your work / business in the future? The reliability analysis is summarized as follows:

**Who filled these canvases?** Eight out ten responding LLs were fulfilling the canvases as a team work. The team composition varied from two persons, four persons or multiple persons in which the number of team member were not explicitly defined. One LL also indicated that an external validation process was taken place in which canvas results were discussed with steering committee and main stakeholders. As a result, it is argued that the responses should be reliable since in most cases multiple persons have been involved in the filling process. Team approach is also typically suggested within Business Model Canvas tutorials and guidelines. The other person who fulfilled canvases alone, indicated strong personal involvement in their LL as well as having a business background. Thus these responses could also considered reliable.

**How much time did it take to fill out the canvases?** Among the respondents, the process of filling the canvases were ranging from 1.5 hours to about 2-2.5 days. The LL reporting only 1.5 hours workload was clearly the lowest. Three LL spent about half a day and the five remaining LL which had indicated response time were spending more than

one day. When including also the number of persons who participated in the data collection process, the amount of resources to give reliable responses is considered sufficient in most cases. The allocated time is also somewhat in-line with typically suggested within Business Model Canvas tutorials and guidelines.

**If it was difficult to fill these, what would be the reason for that, in your opinion?**

The responses relating how easy the canvases were to fulfil were clearly mixed. Partially this could be explained if LL had or not had the previous canvas filling experience or a person having business consulting experience (or similar). If the canvases had been used in the team before or person(s) had business consulting experience, filling the canvases were somewhat straight forward process. In contrast, without prior experience seemed to require more efforts. However, the prior experience was not the only nominator when considering the effortlessness of filling process. Few respondents also argued difficulties were derived by the fact that their LL was at early development stage or the LL was a part of larger organization and therefore not considered as a own business unit, which have a specific business model. As a result, these respondents did not have a clear vision what is their business model, which naturally makes canvas filling difficult. There are also indications that some of the canvas elements and the questions derived from these elements were hard to interpret. Therefore the help from business consulting (or similar) expert who would thoroughly understands the canvas models, would valuable help in the filling process. Also Service Logic Business Model Canvas by Ojasalo and Ojasalo (2015) was considered by one LL more as B2C rather than B2B tool.

**Any suggestions of how to develop these canvases to help you out in developing your work / business in the future?** It appears that according to the few respondents, the current canvas tools are not optimized for LL business development. Developing tailor made "Business Model Canvas" tool for LL needs was e.g. suggested as one option or at least having a more specific guidelines for filling process (note from authors: few reference pointers were given in the filling guidelines, but not step-by-step instructions). Using Excel sheet as data collection tools also gained critics by one LL. One of the LLs was also currently using Balance Score Card approach to define their further strategy and argued that Business Model Canvas was therefore not perfectly fitting their needs. In all using (one) simple enough tools as a starting point was suggested by one LL as a good starting point.

Based on the above feedback, evidently there is a need to develop better and simpler tools for LL business modelling development. However, the composition of respondents and the amount of the allocated resources could be considered as a sufficient for our research purposes. Therefore the data is a robust enough to identify the key attributes within various business model canvases.

## **4 Results**

### ***4.1 Key partners***

The key partner included following attributes:

- 1) National and international research and education organizations [total number of responses 12],
- 2) Selected companies (ranging from SMEs to MNC) and organization with long term relationship or cluster or ecosystem membership, e.g. also insurance companies, banks, tele operators, equipment vendors and manufacturers [9],
- 3) Public and private hospitals; healthcare centers; primary care units; nursery homes, clinics, hospital districts [7],
- 4) ENoLL network and other affiliated Living labs [4]; Policy makers in municipals [4], Technology and science parks; incubators, accelerators, chamber of commerce and industry [4],
- 5) Cities and municipals (as healthcare providers) [3], Experts and expert groups; advisory companies; research councils [3],
- 6) Regional councils and development units [2], Students [2]
- 7) 3 sector organization; national and international NGOs, patient and senior organizations [1], Central IT department in the region [1], National health authority; state budgetary units [1]

As a result national and international research and education organization are the most important (12 responses) partners for Health and Wellbeing Living Labs. Furthermore selected companies ranging from small and mediums size (SMEs) companies to Multinational Corporations (MNC) are also forming another key partner group. When operating in the field of healthcare and wellbeing, also hospitals (or similar entities) are essential partners for Living Labs. Otherwise, the diversity of the named key partners (10 different types) was considered wide.

#### 4.2 Key activities

The key activities included following attributes:

- 1) Education [total number of responses 7],
- 2) Consultation [6], Development, tests and workshops [6],
- 3) Project management and network [5], Research [5]
- 4) Data management [2], Events [2], Externally funded projects [2]
- 5) Marketing and sales support [1], Analysis [1], Clinical trial [1], Open access to infrastructure [1], P – P – P [1], Steering group for innovation acts [1], Support (political) committee [1], Supporting bridge between healthcare and companies [1], Regional innovation governance and support system [1]

Education with 7 responses was the most popular activity among the Health and Wellbeing Living Labs, which could be considered a bit odd since the “consultation, development, testing and running workshops” with 6 responses remained second even if by following LL definition this could be considered as a clear winner. Managing project and networks gained 5 responses as well as research, which can be considered to be closely related to “development, testing and running workshops” activity. Other named activities (12 different) gained only one or two responses.

#### 4.3 Key resources

The key resources included following attributes:

- 1) Physical Living lab including related technical facilities and infrastructure [total number of responses 10]
- 2) Own qualified staff (e.g. experts, teachers, researchers) [9],
- 3) (High level) healthcare professionals in hospitals and municipals [4]
- 4) Prior field, technical, medial service, substance, simulation and pedagogy/training experience and skills [3]
- 5) External consults and own consulting contracts [2], Fund raising skills and project funds [2], Multi professionalism and cross disciplinary teams [2], Students [2],
- 6) Data analysis [1], Established international networks [1], Healthcare data and healthcare data infrastructure [1], Knowledge (of legal issues) [1], Network and project management [1], Own databank from end-users [1], Patients [1], Scientific publication databases [1], Arena management team [1]

The physical Living lab, including related technical facilities and infrastructure, seemed to be the most important (10 responses) while own qualified staff including different roles was the second common with 9 responses. Together these form, the backbone of the LL resources. The healthcare professionals in hospitals and municipals (i.e. the partner) were also named as key resources by 3 partners. This observation highlights the close collaboration relationship between the LL and hospitals and other related healthcare organizations.

#### 4.4 Value proposition

The value proposition was grounded on the following attributes:

- 1) Multidisciplinary development and research [total number of responses 6],
- 2) New scientific coveries / up-to-date knowledge [5]
- 3) Unique testbed and test setup [4]
- 4) Access to public facilities and resources [2], Education (guide, familiarization) [2], Access to end-user and their perspectives (recruitment, involvement) [2], (Public) partner for grants [2]
- 5) Competent consulting [1], Cost-effective development [1], Fast access to piloting [1], Measure and development [1], One stop for all problems [1], Personalized wellbeing services [1], Project management [1], Simulation laboratories [1], Visibility

Multidisciplinary development and research process with 6 responses and new scientific discoveries / up-to-date knowledge with 5 responses, were the most common value proposition arguments. Unique testbed and test setup offering was also among the most common arguments with 4 responses.



#### *4.5 Customer relationships*

The customer relationships were based on the following attributes:

- 1) Long-term relationships [total number of responses 5],
- 2) Direct contacts [2]
- 3) Agreements with internship providers [1], Business advisory and support [1], Care providers network [1], Co-creation and community [1], Company networks [1], Fast access to piloting [1], Innovation actors and cluster accelerator's network [1], Institutional networks [1], International events [1], Ministry [1], Research networks [1]

Long-term relationships was clearly the most commonly named customer relationship type with 5 responses, while direct contacts with 2 responses was one of the other who got more than one response. In all 11 other types of customer relationships were named. Different kinds of networks were named individually making network as a one of the key relationship types.

#### *4.6 Channels*

The channels were based on the following attributes:

- 1) Internet and social media [total number of responses 11],
- 2) Networks [9], Face - to - face discussions, information road trips, emails [9]
- 3) Events [8],
- 4) Advertisement [5],
- 5) Presentations and publications [4]
- 6) Education and workshops [3]
- 7) Newsletter [2], blogs [2], Positions in associations and public bodies [2]
- 8) Advisory meetings [1], Education and workshops [1], Expert opinions [1], Information meetings [1], Internship in education [1], Media [1], Partners [1], Personal contacts [1], Policy and strategy papers [1], PR [1], Projects [1]

Online presence in Internet and social media was the most often named channel with 11 responses. Networks and one-to-one discussions either by face-to-face discussion or emails were the second most popular channels with 9 responses. Events with 8 responses were also considered popular. Some of the Living Labs were also advertising since there were 5 responses for that particular attribute. In all LLs appears to be using a diverse set of channels.

#### *4.7 Customer segments*

The main customer segments were based on the following attributes:

- 1) Developers and producers within SMEs and startups [total number of responses 9]

- 2) Professionals, students and teachers [4], Public service research organization [4]
- 3) Care providers [3], End-users [3], Public service providers [3], Regional hospitals and health centers [3],
- 4) 3rd sector organizations [1], Cities and regions [1], International partners [1], Policy makers [1], Public organizations [1], Re-sellers and distributors [1], Areas where competences [1],

SMEs and startups were most often named customer segments with 9 responses. Various public sector organizations as well as educational sector with 4 or 3 responses are also among the most popular. Interestingly, end-users (also individuals) are named as a customer. Since customer term was not explicitly defined in the further studies the role of end-user as customer needs clarification.

#### *4.8 Cost structure*

Living Labs cost structure was based on the following attributes:

- 1) Staff/personnel/human resources, [total number of responses 16]
- 2) Physical and technical infrastructure such as real-state (rent), labs, utilities, equipments, depreciation (of truck), outsourced services [11]
- 3) Marketing and promotion including customer acquisition costs and end-users, [7]
- 4) Operational costs relating Living lab activities including setup, materials, consumables and reagents [4]
- 5) Patents and IPR protection [3]
- 6) ICT costs such as network, hosting costs, (software) licences, software development [2]
- 7) End-user fees [1], participation of other organizations staff and external experts such as consultants, legal experts, accounting, regional staff, cluster office employees 1], network membership fees, conference and event participation fees, 1], travelling [1], Participation in collaborative projects [1], Student's internship fees [1]

Cost derived from human resources (all respondents) and infrastructure (11 responses), were the most common cost types. Customer and end-users acquisition with 7 responses was also among the most popular.

#### *4.9 Revenue streams*

The most popular Living Labs revenue stream were based on the following attributes:

- 1) National grants [total number of responses 10]
- 2) International grants [7]
- 3) Invoicing (testing and developing) [6]
- 4) Basic funding from municipality / ministry [2], Donations [2], Institutional grants [2], Membership fees [2], Rents of infrastructure [2], Royalties from IP [2], Studies / site visits / service presentations [2], Workshops and consultations [2],

- 5) Events [1], Equipment dealing [1], Internal budget funding [1], Organizing groups [1]

Grant based revenues streams (National grants 10 responses and international grants 7 responses) were most often named revenue streams, indicating heavy dependency for public project funding. Invoicing based on Living Lab testing or development activities with 6 responses were the third most popular revenue stream approach, which indicates that there are also LL activities which are executed without public funding. The remaining other revenue streams received only modest popularity.

## 5 Conclusions

The business models among the Living Labs have been uncharted. Instead of relying in one or a few case LLs, this study described attributes for all nine Business Model Canvas elements within 16 Health and Wellbeing Living Labs from Baltic Sea Region. Compared to many other Living Lab studies, the sample size of this study could be considered substantial. On the basis of reliability analysis, the composition of respondents and the amount of the allocated resources to fulfil the canvases were argued to be sufficient for our research purposes.

As a result, the attribute identification of nine business model canvas elements supports previous suggestions which argue that Living Labs have common elements, but multiple different implementations. The Health and Wellbeing Living Labs appear to be tightly connected with national and international research and education organizations, public sector actors as well as with selected companies varying size ranging from SMEs to MNC. Interestingly, the business models seems to be compound by an interesting relationship in which partners and customers can actually be the same entity.

As a result, these findings suggest that customer's contribution to the Living Lab service delivery is an integral part of the service success. Therefore it is argued that Living Lab is a Knowledge-intensive business service (KIBS) – *“an entity whose primary value-added activities consist of the accumulation, creation, or dissemination of knowledge for the purpose of developing a customized service or product solution to satisfy the client's needs”* (Bettencourt et al., 2002). As a result, the Client Co-Production Management Process model proposed by Bettencourt et al. (2002) could offer an excellent tool to reveal more in-depth understanding of the Living Lab vs. customer relationship. This kind of analysis also could help developing a sustainable business model for a Living Lab, which is grounded on strong partnerships with carefully selected customers, instead of relying heavily on the project grants.

Living Labs are not only a research and development organizations, since education related activities, students as customers and studying courses as channels were highlighted in multiple responses. Traditionally Living Labs have been seen first and foremost as an innovation ecosystems, whereas educational aspects have not been highlighted. Therefore further Living Lab studies should also focus the learning and pedagogical aspects of Living Labs. Pedagogical paradigms such as project - and problem based learning could offer a good starting point for these kinds of studies.

Living Lab resource and cost structure seem to be heavily grounded on the human resources and technical infrastructure which is enabling research and development in real life environment. It is assumed that Living Labs must have relatively high fixed costs,

unless they are following project based model, in which staff and facilities are setup mainly on project based. Project-based model is probable, since national and international grants were most often named as the revenue streams. The composition of grant based revenue and project based resource allocation might be the main Achilles heel for Health and Wellbeing Living Labs. Without long term dedication, it might be difficult to provide the suggested value proposition which is typically grounded on multidisciplinary, specialization and up-to-date knowledge.

The follow-up studies should try to quantify, how important the different attributes are for the various Living Labs. Based on the responses, it is expected, that some of the Living Labs did not report all their attributes e.g. due lack of the business modelling capabilities or lack of the space in the canvases or some other reason. The feedback loop to verify and to extend the attributes is required to build up a solid list of attributes.

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## APPENDIX 1: Business Model Canvas element comparison and added attributes

<i>Canvas elements</i>	<i>Business model Canvas</i>	<i>Lean Canvas</i>	<i>Service Business Model Canvas</i>	<i>Service Logic Business Model Canvas</i>
1. Key partners	X		X, but partner(s) also analysed via same 7 attributes as the focal company	X, but also from customer viewpoint
2. Key activities	X		X, but also from customer(s) and partner(s) point of view	
3. Key resources	X		Also from customer(s) and partner(s) point of view	X, but also from customer viewpoint
4. Value proposition	X	X, with unique notation	Also from customer(s) and partner(s) point of view	X, but also from customer viewpoint
5. Customer relationships	X		named customer(s) and partner(s) point of view	
6. Channels	X		Also from customer(s) and partner(s) point of view	
7. Customer segments	X	X	Customer(s) analysed via same 7 attributes as the focal company	
8. Cost structure	X	X	Also from customer(s) and partner(s) point of view	X, but also from customer viewpoint
9. Revenue streams	X	X	Also from customer(s) and partner(s) point of view	X, but also from customer viewpoint

Attributes beyond original Business Model Canvas: (1) Early adopters as sub customer segment, (2) Problem, (3) Existing alternatives, (4) Key metrics, (5) Unfair advantage, (6) Solution (note: might be also considered as activities but using a different name), (7) Mobilizing resources and partner, (8) Interaction and co-production and (9) Customer's world and desire for ideal value.